

Serial No.: 10/068,364

PATENT APPLICATION

Docket No.: NC 83,665

Joyce discloses a method of laser transfer using a laser transparent substrate with a laser absorptive polymer film and a metal containing composite on the film (abstract).

Bills discloses a method of transferring a thermal mass transfer material, such as a colorant, pigment, or dye, from a donor element to a receiving element.

Baer discloses a process for transferring tissue to a thermoplastic film by melting the film with a laser and adhering the tissue to the melted film (col. 1, lines 26-35).

Mayer discloses a method of laser transfer using an ultrafast laser pulse that vaporizes a portion of an electrically conductive film on a transparent substrate, such that the vaporized film material is propelled toward and deposited upon a working substrate.

In order to make a *prima facie* case of obviousness, each claim limitation must be disclosed in the references. None of the references discloses the limitation in claim 1 that the composite material, being a mixture of matrix material and transfer material, is deposited onto the receiving substrate. The present claim 1 recites that the composite comprises a mixture. The composite is then desorbed. Since it is the composite that is desorbed instead of just one component of the composite, the desorbed composite also comprises the mixture. The desorbed composite is then deposited on the receiving substrate, still comprising the mixture. Although a layer of matrix material adjacent to the laser-transparent support might be lost, the deposited composite is a mixture of matrix material and transfer material.

Bills disclose that the donor sheet can comprise a mixture of thermal mass transfer material, gas producing polymer, and black metal radiation absorber (col. 3, lines 43-49). However, the mixture is not deposited on the receiving element. Bills specifically states "that upon application of heat, the thermal mass transfer material is transferred from the donor element to the receiving substrate." (col. 12, lines 33-35.) The examples repeatedly state that there is no discoloration of the imaged areas due to transferred black aluminum. It is also explained that "the black aluminum exothermically oxidized to Al_2O_3 , which is colorless, and propelled the pigment to the receiver. The advantage of this material system is that the absorber is bleached, and the donor film can be used as an imagesetting film since it absorbs in the UV." (col. 2, lines 20-25.) Thus, the black metal remains on the donor. The gas-producing polymer is converted to a gas and not deposited. It appears that the thermal mass transfer material is the only component that is transferred. Even if a portion of the gas producing polymer were transferred, the mixture of all three components is the only disclosed mixture that includes the thermal mass transfer

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material. So a supposed deposit of a mixture of gas producing polymer and thermal mass transfer material would not be the original mixture.

The Examiner stated that Bills teaches the equivalence between supplying the matrix materials and transfer materials as separate layers or as a single blended layer. However, this is the case in Bills because only one component is transferred, whether starting as a mixture or as separate layers. In the present invention, both the matrix and transfer materials are transferred, as a mixture.

In Joyce, the film is a multi-layered composite comprising laser absorptive polymer 12a, gold 12b, nickel 12c, and gold-flash 12d (Fig. 2 and col. 4, lines 32-59). As stated by the Examiner, Joyce does not disclose that the composite is a mixture. Thus, Joyce does not disclose that the composite material mixture is deposited onto the receiving substrate.

The process of Baer is entirely different from the presently claimed process. In Baer, the laser interacts only with the film, not with the tissue. This is not a laser transfer process, but rather a laser interaction with a polymer film that induces a morphological change in the polymer, which then results in an adhesion process between the biomaterial and polymer. The only transfer occurs when the film is peeled off of the sample and the adhered tissue goes with the film. In the present invention, the composite transfers through space/air in a free-flight manner. In Baer, the tissue is attached to a surface at all times.

In Mayer, the transfer material is completely vaporized. This is inconsistent with maintaining the composite mixture throughout the transfer.

Since none of the references discloses the limitation, a *prima facie* case has not been made.

These claims are to transfers of biomaterials. Such materials would be expected to be completely destroyed if vaporized using the method of Joyce, due to the high laser energy used. For example Joyce mentions that a range of 8-12 J/cm² should be used (col. 5, line 42). The present application states a typical range of 50 to about 200 mJ/cm² (0045), although the claims are not limited to this range. The energy in Joyce may be hundreds of times that used in the present invention to transfer biomaterial. Further, in Joyce, the transferred material slams into the substrate at a pressure of 15-20 kbars (col. 3, lines 30-32). At such extreme energies and pressures, the biomaterial would denature, die, or be completely vaporized and the process would be useless.

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The Examiner stated that as both Joyce and Baer disclose a laser absorbing material, and that the laser absorbing material in Baer keeps the transfer material from being damaged, then the laser absorbing material in Joyce would do the same. However, these two laser absorbing materials perform different functions. The material in Baer only needs to absorb enough energy to cause adhesion to the biomaterial. If this laser absorbing material and biomaterial were exposed to the laser fluence used in Joyce, both the laser absorbing layer and the biomaterial would be destroyed.

Further there is no motivation to combine Baer with Joyce and no reasonable expectation of success of the combination, as the processes are incompatible with each other. They expose different elements to laser beams that approach from opposite directions. There is nothing in the references to suggest that the tissue of Baer could be transferred intact according to the methods of Joyce, or that it could remain living or active.

Claims 2-7, 13-18, 22-25, and 27-44 depend from and contain all the limitations of claim 1 and are asserted to distinguish from the references in the same manner as claim 1.

Further, as to claim 23, the references do not disclose any functionalization of the receiving substrate, nor any of the specific functionalizations recited in claim 24.

Claims 8-12 and 21 have been rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Joyce in view of Bills, Baer, Mayer, and further in view of Ross, US 5,743,560.

Claims 8-12 are directed to laser-machining of the receiving substrate and/or the deposited transfer material. Claim 21 recites a non-planar receiving substrate. Ross discloses laser-texturing of a metallic layer deposited on a glass substrate (Abstract) and laser-texturing of a glass substrate (col. 2, lines 10-12). Ross does not disclose the limitation that the composite material mixture is deposited onto the receiving substrate.

Claims 8-12 and 21 depend from and contain all the limitations of claim 1 and are asserted to distinguish from Joyce and Bills in the same manner as claim 1, in that Joyce, Bills, Baer, and Mayer do not disclose that the composite material mixture is deposited onto the receiving substrate. Similarly, Ross does not disclose such a deposit. As none of the references discloses the limitation, a *prima facie* case of obviousness has not been made.

Further as to claim 21, Ross does not disclose a non-planar substrate. Although the

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substrate in Ross is machined to have fine details, the substrate is still macroscopically planar. A non-planar substrate may be curved, such as the surface of a cylinder, or may have macroscopic steps. If non-planar substrates included the machined substrate of Ross, then virtually any substrate could be considered non-planar, as even an atomically smooth substrate has peaks and valleys that lie in different planes.

In view of the foregoing, it is submitted that the application is now in condition for allowance.

In the event that a fee is required, please charge the fee to Deposit Account No. 50-0281, and in the event that there is a credit due, please credit Deposit Account No. 50-0281.

Respectfully submitted,



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